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Prosthetic Socket Surface Initialization – For Future Use in Subject-Specific Socket Optimization

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Abstract

For persons with lower limb amputations the human-prosthesis interface, termed the "prosthetic socket," remains an area of ongoing research. Patient satisfaction is closely tied to the physical comfort of the device, which includes performance factors such as fit, moisture management, stiffness/rigidity, stress concentrations, range of motion, etc. An imbalance in these factors may result lack of mobility for the patient or worse, pressure sores, a precursor to debilitating deep tissue ulcerations. Ulcerations are well documented and current socket fitting techniques, as performed by a "prosthetist," are largely subjective, relying on the prosthetist's experience and feedback from the patient.

With the goal to achieve easy to manufacture patient-specific prosthetic socket designs, the technical aim of this work was to develop one critical aspect of a proposed work flow. Specifically, this work covers development and evaluation of an approach for creation of parametrized socket geometry. Accessible parameters that define a socket's geometry are easily updated during iterative computer simulations, which are to be developed in future work. Initial results yielded an undesirable number of variables at the desired accuracy, yet the method appears well suited for description of other complex geometries.